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GENERAL INSTRUCTIONS

FED. SUPPLY CLASS

5340

1. **DESCRIPTION:** Helical coil inserts are screw thread bushings coiled from diamond shaped cross-section wire. They are screwed into tapped holes to form nominal size internal threads. Inserts are installed by torquing through a diametral tang which is notched for tang removal.
2. **MATERIAL:** As specified on the drawing.
3. **THREADS:** Assembled inserts, Classes 2B and 3B, are controlled by the tolerance range of the tapped hole into which insert is fitted. Due to the radius on the crest of the insert at the minor diameter, the assembled insert will accept external threaded parts which are threaded to AS8879. The grip coil or coils of the screw locking insert are shaped to provide a prevailing torque when the screw is installed in the assembled insert.
- ①
4. **TAPPED HOLE:** 60° Unified Internal thread form with the minimum major diameter based on a truncation to 0.125p.
- 4.1 **Designation for tapped hole:** The drawing note for the tapped hole, per table IV, that will accept the helical coil insert shall be in accordance with the following examples:

EXAMPLE 1

.3125-24 UNF-3B HELICAL COIL
INSERT THD PER NASM33537
.67 MIN FULL THD DEPTH

①

.3125-24 UNF-3B HELICAL COIL
INSERT THD THRU PER NASM33537
INSTALL INSERT .75-1.5 TURNS
BELOW SURFACE
REMOVE TANG - (NOT REQUIRED WITH
TANGLESS INSERTS)

①

For Blind Hole (Based on 2 Diameter
Engagement) (Minor Diameter Drill Depth
Tolerance approx. .060 or as otherwise
appropriate)

For thru hole with Insert being Assembled
(Based on 2 Diameter Engagement)

THE INITIAL RELEASE OF THIS DOCUMENT SUPERSEDES MS33537, REVISION E, AMENDMENT 1. PART NUMBERS REMAIN MS33537

THIRD ANGLE PROJECTION		CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 1
PROCUREMENT SPECIFICATION NONE		TITLE INSERT, SCREW THREAD, HELICAL COIL, INCH SERIES, COARSE AND FINE THREAD, STANDARD ASSEMBLY DIMENSIONS FOR	CLASSIFICATION PART STANDARD NASM33537 SHEET 1 OF 14

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FORM 08-02

ISSUE DATE: MAY 2002 REVISION DATE: MARCH 10, 2009



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EXAMPLE 2

MINOR DIA .3215-.3288 x .791-.851 DEEP
.36-.39 DIA x 115°-125° CSK
THD PER NASM33537 FOR ①
.3125-24 UNF-3B HELICAL COIL INSERT
.67 MIN FULL THD DEPTH
PITCH DIA .3395-.3421
MAJOR DIA .3666 MIN

MINOR DIA .3215-.3288 THRU
.36-.39 DIA x 115°-125° CSK ①
THD THRU PER NASM33537 FOR
.3125-24 UNF-3B HELICAL COIL INSERT
PITCH DIA .3395-.3421
MAJOR DIA .3666 MIN
INSTALL INSERT .75-1.5 TURNS
BELOW SURFACE
REMOVE TANG - (NOT REQUIRED WITH TANGLESS
INSERTS)

5. **REDUCED FIRST COIL:** The first coil of the free insert adjacent to the tang has been reduced in diameter on the larger inserts to facilitate starting the insert into the tapped hole.

6. **DIMENSIONAL DATA:**

- 6.1 For free running and screw locking inserts having a nominal length of 1, 1.5, 2, 2.5, and 3 times the nominal major diameter of the screw thread, dimensional data for the following features have been calculated and are listed in Table IV:

Nominal length (L_n)
Length of assembled insert (L)
Tapped hole diameters (V , V_1 , V_2)
Depth of drilling and tapping (FP , FB , and H)
Countersink diameters (M)
Required bolt thread projection (J and K)

For all other nonstandard variations in nominal length, the above dimensions shall be calculated from the formulas given in Table III, using rounding procedures contained in ASTM SI 10. ①

- 6.2 See Table I for MS part numbers and nominal lengths of available inserts.

- 6.3 **INSERT LENGTH SELECTION:** For applications where the tensile strength of the installed insert is a consideration, Table II will aid in applying the standard design practice of relating the tensile strength of the bolt material against the shear strength of the parent or boss material to develop the full load value of the bolt rather than stripping the parent or tapped material. In using this table, the following factors must be considered.

- 6.3.1 Actual bolt tensile strength, particularly in the lower bolt tensile ranges, may be significantly higher than the nominal values. This should be considered in insert length selection.
- 6.3.2 The parent material shear strengths are for room temperature. Elevated temperatures significantly reduce shear strength values; compensation should be made when required.
- 6.3.3 When parent material shear strength falls between two tabulated values, use the lower of the two.

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7. **DEPTH OF RECOMMENDED MINIMUM TAP DRILL HOLE:** The tabulated depth of blind hole for thread tapping allows sufficient depth for assembled insert top coil to be 1.5 pitches below boss surface. For insert sizes .3125 and smaller, drill depth FP provides for minimum full thread depth H, using a plug tap having 4 pitches tap chamfer, plus a length equal to $0.5 \times$ nominal insert size to clear the tap external center (conical end), plus 1 pitch tap end clearance. For insert sizes larger than .3125, drill depth FP is for plug tap having 4 pitches tap chamfer, plus 1 pitch tap end clearance. Drill depth FB is for bottoming taps having 2 pitches tap chamfer, plus 1 pitch tap end clearance. If tap drill holes are not countersunk, the assembled insert top coil may be 0.5 pitch max below boss surface which allows for a 1 pitch reduction in tabulated depth of blind drilled hole dimensions.
8. **DEPTH OF FULL THREAD OF TAPPED HOLE:** For thru or blind tapped holes with a countersink as specified in Table IV, the Minimum Full Thread, H (also minimum flange thickness for thru hole), equals nominal length of insert, L_n , as specified in the tabulation, plus 1 pitch. For thru or blind tapped holes without countersink, the minimum full thread (also minimum flange thickness for thru hole) shall not be less than the nominal length of insert, L_n .
9. **LENGTH OF BOLT THREAD PROJECTION:**
 - 9.1 **INSERT WITH TANG REMOVED:** The maximum length of bolt thread projection, J, into the assembled insert in a blind hole is equal to the minimum design depth of the tap drill hole, FP or FB. The minimum length of bolt thread projection to provide full thread engagement and thus to ensure full development of potential joint tensile strength is J_{min} . It is equal to the maximum length, L, of the insert, plus 3 pitch (the maximum depth of the assembled insert top coil from boss surface, 1.5 pitch, plus bolt chamfer 1.5 pitch). Bolt projection, J_{min} , will also ensure full engagement with the grip coil or coils of a screw locking insert.
 - 9.2 **INSERT WITHOUT TANG REMOVED:** The maximum length of bolt thread projection, K, into the assembled insert when tang is not removed is the minimum length of insert plus 0.25 pitch.
10. **COUNTERSINK AND COUNTERBORE:** The values given in Table IV for Depth of Hole, FP, FB, Minimum Full Thread H, and Length of Bolt Projection, J and K, are measured from the top surface of the boss or piece and are based on installing the insert below the countersink as in 11.1. If a counterbore or countersink other than that shown is required or no countersink is used, the values for FP, FB, H, J, and K must be modified to compensate.

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11. INSTALLATION OF INSERT:

11.1 WITH COUNTERSUNK HOLE: The top edge of the insert shall be installed 0.75p to 1.5p below top surface of the tapped hole.

11.2 WITHOUT COUNTERSUNK HOLE: The top edge of the insert shall be installed 0.25p to 0.5p below top surface of tapped hole.

11.3 TANG REMOVAL: The tang should be removed from the insert after installation.

12. BLIND HOLE ASSEMBLY (WITHOUT REMOVAL OF TANG): When the insert tang is not removed, as may be the case with blind hole applications, an insert 0.5 diameter longer than the required nominal length will fulfill the necessary bolt-insert full thread engagement, provided that the bolt projection satisfies the original J_{min} and the longer insert K_{max} tabulated values.

13. GAGING PRACTICE: Accuracy of the finished thread, when the insert is installed, is dependent upon the accuracy of the tapped hole. If the finished tapped hole gages satisfactorily, the installed insert will be within the thread tolerance when the insert meets the drawing requirements. It is, therefore, not necessary to gage the installed insert. After the insert is installed, the GO thread plug gage may not enter freely because the insert may not have been fully seated in the tapped hole; however, the insert should become seated after a bolt or screw is installed and tightened.

14. PERMITTED MODIFICATIONS: Values for FP, FB, H, J, K, M, and installation depth of insert may be modified to suit requirements for production tooling, design, assembly, etc. See Table III for formulas. Countersink included angle may be modified from $120^\circ \pm 5^\circ$ to 90° provided that for UNC sizes .190-24 and smaller and UNF sizes .4375-20 and smaller, the top edge of the insert shall be installed 1.0 to 1.5p below top surface of the tapped hole.

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TABLE I. PART NUMBERS.

INSERT NOMINAL LENGTH	FREE RUNNING INSERTS		SCREW LOCKING INSERTS	
	CRES AS7245		CRES NASM8846	
	COARSE	FINE	COARSE	FINE
1 DIA	MS122076 thru MS122115	MS124651 thru MS124690	MS21209C0210 thru MS21209C2410	MS21209F0310 thru MS21209F2410
1.5 DIA	MS122116 thru MS122155	MS124691 thru MS124730	MS21209C0215 thru MS21209C2415	MS21209F0315 thru MS21209F2415
2 DIA	MS122156 thru MS122195	MS124731 thru MS124770	MS21209C0220 thru MS21209C2420	MS21209F0320 thru MS21209F2420
2.5 DIA	MS122196 thru MS122235	MS124771 thru MS124810	MS21209C0225 thru MS21209C2425	MS21209F0325 thru MS21209F2425
3 DIA	MS122236 thru MS122275	MS124811 thru MS124850	MS21209C0230 thru MS21209C2430	MS21209F0330 thru MS21209F2430

① NASM21209 offers Cadmium Plating and Dry Film Lubricant Coating options.

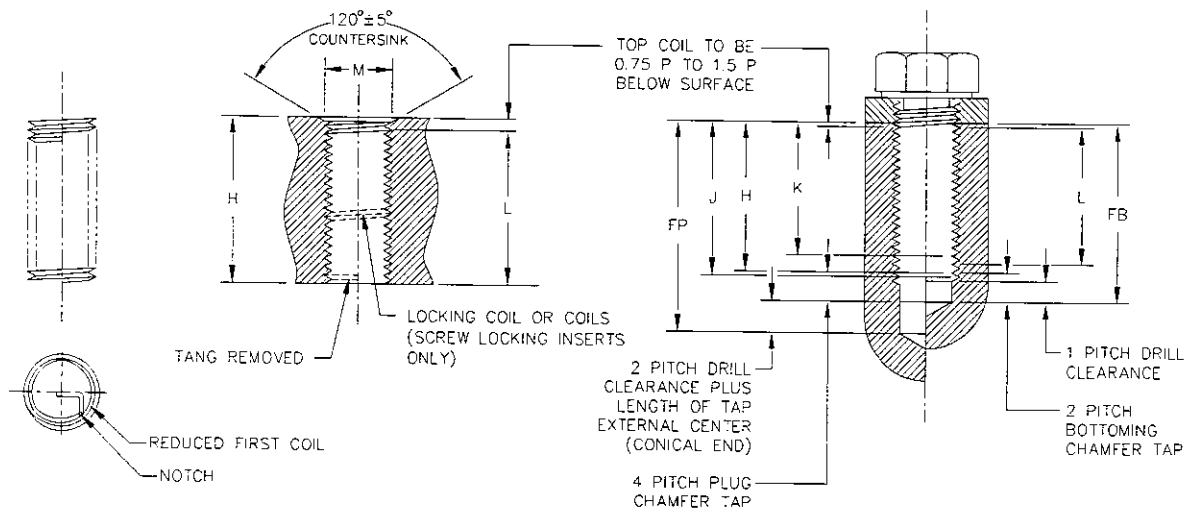


FIGURE 1

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TABLE II. LENGTHS OF THREAD ENGAGEMENT IN TERMS OF NOMINAL THREAD SIZE

Shear Strength of Material (psi) (Alum., Mag, Steel)	Bolt Material Minimum Ultimate Tensile Strength (psi)								
	54,000	75,000	96,000	108,000	125,000	132,000	160,000	180,000	220,000
10,000	2	2-1/2	3	3	-	-	-	-	-
15,000	1-1/2	1-1/2	2	2-1/2	2-1/2	3	3	-	-
20,000	1	1-1/2	1-1/2	2	2	2	2-1/2	3	3
25,000	1	1	1-1/2	1-1/2	1-1/2	2	2	2-1/2	2-1/2
30,000	1	1	1	1-1/2	1-1/2	1-1/2	2	2	2-1/2
40,000	1	1	1	1	1	1-1/2	1-1/2	1-1/2	2
50,000	1	1	1	1	1	1	1	1-1/2	1-1/2

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TABLE III.

INFORMATION REQUIRED (SEE FIGURE 1)	FORMULA
Length of Assembled Insert (L) Free Running and Screw Locking	$L_{min} = L_n - 0.75P$ $L_{max} = L_n - 0.5P$
Depth of Recommended Minimum Tap Drill (FP or FB) for Blind Holes (Paragraph 7)	1. For Plug Taps .3125 Nominal Diameter and smaller: $FP = L_n + 6P + 0.5 D_n$ 2. For Plug Taps larger than .3125: $FP = L_n + 6P$ 3. For Bottoming Taps: $FB = L_n + 4P$
Depth of Full Thread of Blind Tapped Hole H (also Min. Flange Thickness for Thru Tapped Hole) (Paragraph 8)	$H_{min} = L_n + 1P$
Countersink or Counterbore (M) (Paragraph 10)	$M_{min} = V_2 \text{ max Class 3B} + B_{max} - D_{min}$ $M_{max} = M_{min} + .030$
Length of Bolt Thread Projection into Assembled Insert (J or K) (Paragraph 9)	1. <u>Insert - Tang Removed</u> $J_{max} = FP_{min}$ (blind hole depth for plug tap) $J_{max} = FB_{min}$ (blind hole depth for bottoming tap) $J_{min} = L_{max} + 3P$ or $J_{min} = L_n + 2.5P$ 2. <u>Insert - Tang Not Removed</u> $K_{max} = L_{min} + 0.25P$

WHERE:

L_n = Nominal Length of Insert (Table IV)

P = Pitch = 1/Threads Per Inch

B = Wire Height from NASM21209 ①

D = Wire Pitch Line from NASM21209 ①

D_n = Nominal Insert Size (Diameter)

V_2 = Tapped Hole Pitch Diameter (Table IV)

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TABLE IV.

Nominal Insert Size		.073	.086		.099		.112		.125
Threads Per Inch		64	56	64	48	56	40	48	40
Ln	Insert Nominal Length, 1 DIA	.073	.086	.086	.099	.099	.112	.112	.125
	Insert Nominal Length, 1.5 DIA	.110	.129	.129	.148	.148	.168	.168	.188
	Insert Nominal Length, 2 DIA	.146	.172	.172	.198	.198	.224	.224	.250
	Insert Nominal Length, 2.5 DIA	.182	.215	.215	.248	.248	.280	.280	.312
	Insert Nominal Length, 3 DIA	.219	.258	.258	.297	.297	.336	.336	.375
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
		Nominal Length = 3 DIA							
	D2	PD, Max, Class 2B	.0655	.0772	.0786	.0885	.0902	.0991	.1016
		PD, Max, Class 3B	.0648	.0765	.0779	.0877	.0895	.0982	.1008
		PD, Min, Classes 2B & 3B	.0629	.0744	.0759	.0855	.0874	.0958	.0985
	D1	Minor Dia, Max, Class 2B	.0623	.0737	.0753	.0845	.0865	.0939	.0968
		Minor Dia, Max, Class 3B	.0623	.0737	.0753	.0845	.0865	.0939	.0968
		Minor Dia, Min, Classes 2B & 3B	.0561	.0667	.0691	.0764	.0797	.0849	.0894
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA							
		Min When Nominal Length = 1.5 DIA							
		Min When Nominal Length = 2 DIA							
		Min When Nominal Length = 2.5 DIA							
	FB	Depth of Blind Hole for Bottoming Taps,							
		Min When Nominal Length = 1 DIA							
		Min When Nominal Length = 1.5 DIA							
		Min When Nominal Length = 2 DIA							
		Min When Nominal Length = 2.5 DIA							
	H	Min Full Thread When							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
	V2	PD, Max, Class 2B	.0850	.0996	.0981	.1148	.1126	.1308	.1279
		PD, Max, Class 3B	.0843	.0989	.0974	.1140	.1119	.1299	.1271
		PD, Min, Classes 2B & 3B	.0832	.0976	.0962	.1126	.1106	.1283	.1256
	V1	Minor Dia, Max, Class 2B	.0823	.0961	.0947	.1104	.1086	.1252	.1229
		Minor Dia, Max, Class 3B	.0823	.0961	.0947	.1104	.1086	.1252	.1229
		Minor Dia, Min, Classes 2B & 3B	.0764	.0899	.0894	.1036	.1029	.1175	.1166
	V	Major Dia, Max, Class 2B	.0974	.1138	.1105	.1313	.1268	.1506	.1444
		Major Dia, Max, Class 3B	.0967	.1131	.1098	.1305	.1261	.1497	.1436
		Major Dia, Min, Classes 2B & 3B	.0933	.1092	.1063	.1261	.1222	.1445	.1391
	M	Countersink, 120° Included Angle							
		Maximum	.100	.110	.110	.140	.140	.170	.170
		Minimum	.085	.090	.090	.110	.110	.140	.140
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							

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TABLE IV. (Continued)

Nominal Insert Size			.138		.164		.190		.216
Threads Per Inch			32	40	32	36	24	32	24
Ln	Insert Nominal Length, 1 DIA		.138	.138	.164	.164	.190	.190	.216
	Insert Nominal Length, 1.5 DIA		.207	.207	.246	.246	.285	.285	.324
	Insert Nominal Length, 2 DIA		.276	.276	.328	.328	.380	.380	.432
	Insert Nominal Length, 2.5 DIA		.345	.345	.410	.410	.475	.475	.540
	Insert Nominal Length, 3 DIA		.414	.414	.492	.492	.570	.570	.648
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA	.115	.119	.141	.143	.159	.167	.185
		Nominal Length = 1.5 DIA	.184	.188	.223	.225	.254	.262	.293
		Nominal Length = 2 DIA	.253	.257	.305	.307	.349	.357	.401
		Nominal Length = 2.5 DIA	.322	.326	.387	.389	.444	.452	.509
		Nominal Length = 3 DIA	.391	.395	.469	.471	.539	.547	.617
	D2	PD, Max, Class 2B	.1214	.1252	.1475	.1496	.1672	.1736	.1933
		PD, Max, Class 3B	.1204	.1243	.1465	.1487	.1661	.1726	.1922
		PD, Min, Classes 2B & 3B	.1177	.1218	.1437	.1460	.1629	.1697	.1889
	D1	Minor Dia, Max, Class 2B	.114	.119	.139	.142	.156	.164	.181
		Minor Dia, Max, Class 3B	.1140	.1186	.1389	.1416	.1555	.1641	.1807
		Minor Dia, Min, Classes 2B & 3B	.1040	.1110	.1300	.1340	.1450	.1560	.1710
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA	.394	.357	.434	.413	.535	.472	.574
		Min When Nominal Length = 1.5 DIA	.464	.426	.516	.495	.630	.568	.682
		Min When Nominal Length = 2 DIA	.532	.495	.598	.577	.725	.662	.790
		Min When Nominal Length = 2.5 DIA	.602	.564	.680	.659	.820	.758	.898
		Min When Nominal Length = 3 DIA	.670	.633	.762	.741	.915	.852	1.006
	FB	Depth of Blind Hole for Bottoming Taps,							
		Min When Nominal Length = 1 DIA	.263	.238	.289	.275	.357	.315	.383
		Min When Nominal Length = 1.5 DIA	.332	.307	.371	.357	.452	.410	.491
		Min When Nominal Length = 2 DIA	.401	.376	.453	.439	.547	.505	.599
		Min When Nominal Length = 2.5 DIA	.470	.445	.535	.521	.642	.600	.707
		Min When Nominal Length = 3 DIA	.539	.514	.617	.603	.737	.695	.815
	H	Min Full Thread When							
		Nominal Length = 1 DIA	.170	.160	.200	.190	.230	.220	.260
		Nominal Length = 1.5 DIA	.240	.230	.280	.270	.330	.320	.370
		Nominal Length = 2 DIA	.310	.300	.360	.360	.420	.410	.470
		Nominal Length = 2.5 DIA	.380	.370	.440	.440	.520	.510	.580
		Nominal Length = 3 DIA	.450	.440	.520	.520	.610	.600	.690
	V2	PD, Max, Class 2B	.1611	.1569	.1872	.1849	.2203	.2133	.2464
		PD, Max, Class 3B	.1601	.1560	.1862	.1840	.2192	.2123	.2453
		PD, Min, Classes 2B & 3B	.1583	.1543	.1843	.1821	.2170	.2103	.2430
	V1	Minor Dia, Max, Class 2B	.1527	.1503	.1781	.1771	.2087	.2041	.2347
		Minor Dia, Max, Class 3B	.1527	.1503	.1781	.1771	.2080	.2041	.2340
		Minor Dia, Min, Classes 2B & 3B	.1448	.1435	.1708	.1701	.1990	.1968	.2250
	V	Major Dia, Max, Class 2B	.1859	.1767	.2120	.2069	.2534	.2381	.2795
		Major Dia, Max, Class 3B	.1849	.1758	.2110	.2060	.2523	.2371	.2784
		Major Dia, Min, Classes 2B & 3B	.1786	.1705	.2046	.2001	.2441	.2306	.2701
	M	Countersink, 120° Included Angle							
		Maximum	.210	.200	.230	.230	.270	.260	.290
		Minimum	.180	.170	.200	.200	.240	.230	.260
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA	.216	.200	.242	.233	.294	.268	.320
		Nominal Length = 1.5 DIA	.285	.270	.324	.315	.389	.363	.428
		Nominal Length = 2 DIA	.354	.338	.406	.397	.484	.458	.536
		Nominal Length = 2.5 DIA	.423	.408	.488	.479	.579	.553	.644
		Nominal Length = 3 DIA	.492	.476	.570	.561	.674	.648	.752
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA	.122	.126	.149	.150	.169	.175	.195
		Nominal Length = 1.5 DIA	.191	.194	.231	.232	.264	.270	.303
		Nominal Length = 2 DIA	.260	.264	.313	.314	.359	.365	.411
		Nominal Length = 2.5 DIA	.329	.332	.395	.396	.454	.460	.519
		Nominal Length = 3 DIA	.398	.402	.477	.478	.549	.555	.627

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TABLE IV. (Continued)

Nominal Insert Size		.250		.3125		.375		.4375	
Threads Per Inch		20	28	18	24	16	24	14	20
L _n	Insert Nominal Length, 1 DIA	.250	.250	.312	.312	.375	.375	.438	.438
	Insert Nominal Length, 1.5 DIA	.375	.375	.469	.469	.562	.562	.656	.656
	Insert Nominal Length, 2 DIA	.500	.500	.625	.625	.750	.750	.875	.875
	Insert Nominal Length, 2.5 DIA	.625	.625	.781	.781	.938	.938	1.094	1.094
	Insert Nominal Length, 3 DIA	.750	.750	.938	.938	1.125	1.125	1.312	1.312
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
	D2	PD, Max, Class 2B	.2224	.2311	.2817	.2902	.3401	.3528	.3972
		PD, Max, Class 3B	.2211	.2300	.2803	.2890	.3387	.3516	.3957
		PD, Min, Classes 2B & 3B	.2175	.2268	.2764	.2854	.3344	.3479	.3911
	D1	Minor Dia, Max, Class 2B	.207	.220	.265	.277	.321	.340	.376
		Minor Dia, Max, Class 3B	.2067	.2190	.2630	.2754	.3182	.3372	.3717
		Minor Dia, Min, Classes 2B & 3B	.1960	.2110	.2520	.2670	.3070	.3300	.3600
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA							
		Min When Nominal Length = 1.5 DIA							
		Min When Nominal Length = 2 DIA							
		Min When Nominal Length = 2.5 DIA							
	FB	Depth of Blind Hole for Bottoming Taps,							
		Min When Nominal Length = 1 DIA							
		Min When Nominal Length = 1.5 DIA							
		Min When Nominal Length = 2 DIA							
		Min When Nominal Length = 2.5 DIA							
	H	Min. Full Thread When							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
	V2	PD, Max, Class 2B	.2864	.2765	.3529	.3433	.4203	.4059	.4744
		PD, Max, Class 3B	.2851	.2754	.3515	.3421	.4189	.4047	.4731
		PD, Min, Classes 2B & 3B	.2825	.2732	.3486	.3395	.4156	.4020	.4699
	V1	Minor Dia, Max, Class 2B	.2723	.2661	.3372	.3312	.4026	.3937	.4688
		Minor Dia, Max, Class 3B	.2704	.2646	.3342	.3288	.3987	.3910	.4639
		Minor Dia, Min, Classes 2B & 3B	.2608	.2577	.3245	.3215	.3885	.3840	.4483
	V	Major Dia, Max, Class 2B	.3261	.3049	.3970	.3764	.4699	.4390	.5457
		Major Dia, Max, Class 3B	.3248	.3038	.3956	.3752	.4685	.4378	.5442
		Major Dia, Min, Classes 2B & 3B	.3150	.2964	.3847	.3666	.4562	.4291	.5303
	M	Countersink, 120° Included Angle							
		Maximum	.340	.320	.410	.390	.480	.450	.530
		Minimum	.310	.290	.380	.360	.450	.420	.500
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA							
		Nominal Length = 1.5 DIA							
		Nominal Length = 2 DIA							
		Nominal Length = 2.5 DIA							
		Nominal Length = 3 DIA							
		Nominal Length = 3 DIA							

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TABLE IV. – (Continued)

Nominal Insert Size		.500		.5625		.625		.750	
Threads Per Inch		13	20	12	18	11	18	10	16
Ln	Insert Nominal Length, 1 DIA	.500	.500	.562	.562	.625	.625	.750	.750
	Insert Nominal Length, 1.5 DIA	.750	.750	.844	.844	.938	.938	1.125	1.125
	Insert Nominal Length, 2 DIA	1.000	1.000	1.125	1.125	1.250	1.250	1.500	1.500
	Insert Nominal Length, 2.5 DIA	1.250	1.250	1.406	1.406	1.562	1.562	1.875	1.875
	Insert Nominal Length, 3 DIA	1.500	1.500	1.688	1.688	1.875	1.875	2.250	2.250
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA							
		.442	.462	.500	.521	.557	.583	.675	.703
		Nominal Length = 1.5 DIA							
		.692	.712	.781	.802	.869	.896	1.050	1.078
	D2	PD, Max, Class 2B							
		.4565	.4731	.5152	.5323	.5732	.5949	.6927	.7159
		PD, Max, Class 3B							
		.4548	.4717	.5135	.5308	.5714	.5934	.6907	.7143
		PD, Min, Classes 2B & 3B							
		.4500	.4675	.5084	.5264	.5660	.5889	.6850	.7094
	D1	Minor Dia, Max, Class 2B							
		.434	.457	.490	.515	.546	.578	.663	.696
		Minor Dia, Max, Class 3B							
		.4284	.4537	.4843	.5106	.5391	.5730	.6545	.6908
		Minor Dia, Min, Classes 2B & 3B							
		.4170	.4460	.4720	.5020	.5270	.5650	.6420	.6820
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA							
		.962	.800	1.062	.895	1.170	.958	1.350	1.125
		Min When Nominal Length = 1.5 DIA							
		1.212	1.050	1.343	1.176	1.483	1.271	1.725	1.500
	FB	Depth of Blind Hole for Bottoming Taps,							
		Min When Nominal Length = 1 DIA							
		1.462	1.300	1.624	1.457	1.795	1.583	2.100	1.875
		Min When Nominal Length = 1.5 DIA							
		1.712	1.550	1.905	1.738	2.108	1.896	2.475	2.250
	H	Min Full Thread When							
		Nominal Length = 1 DIA							
		.580	.550	.650	.620	.720	.680	.850	.810
		Nominal Length = 1.5 DIA							
		.830	.800	.930	.900	1.030	.990	1.230	1.190
	V2	PD, Max, Class 2B							
		.5554	.5371	.6225	.6035	.6903	.6661	.8216	.7961
		PD, Max, Class 3B							
		.5537	.5357	.6208	.6020	.6885	.6646	.8196	.7945
		PD, Min, Classes 2B & 3B							
	V1	Minor Dia, Max, Class 2B							
		.5335	.5223	.5986	.5872	.6641	.6497	.7926	.7776
		Minor Dia, Max, Class 3B							
		.5273	.5186	.5918	.5826	.6564	.6451	.7838	.7720
		Minor Dia, Min, Classes 2B & 3B							
	V	Major Dia, Max, Class 2B							
		.6165	.5768	.6887	.6476	.7625	.7102	.9010	.8457
		Major Dia, Max, Class 3B							
		.6148	.5754	.6870	.6461	.7607	.7087	.8990	.8441
		Major Dia, Min, Classes 2B & 3B							
	M	Countersink, 120° Included Angle							
		Maximum							
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA							
		.692	.625	.770	.701	.852	.764	1.000	.906
		Nominal Length = 1.5 DIA							
		.942	.875	1.052	.983	1.165	1.077	1.375	1.281
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA							
		.461	.475	.521	.535	.580	.597	.700	.719
		Nominal Length = 1.5 DIA							
		.711	.725	.802	.816	.892	.910	1.075	1.094
	L	Nominal Length = 2 DIA							
		.961	.975	1.083	1.097	1.205	1.222	1.450	1.469
		Nominal Length = 2.5 DIA							
		1.211	1.225	1.365	1.379	1.517	1.535	1.825	1.844
		Nominal Length = 3 DIA							
		1.461	1.475	1.646	1.660	1.830	1.847	2.200	2.219

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TABLE IV. (Continued)

Nominal Insert Size			.8125	.875		1.000		1.0625	
Threads Per Inch			16	9	14	8	12	(ø)14	12
Ln	Insert Nominal Length, 1 DIA		.812	.875	.875	1.000	1.000	1.000	1.062
	Insert Nominal Length, 1.5 DIA		1.219	1.312	1.312	1.500	1.500	1.500	1.594
	Insert Nominal Length, 2 DIA		1.625	1.750	1.750	2.000	2.000	2.000	2.125
	Insert Nominal Length, 2.5 DIA		2.031	2.188	2.188	2.500	2.500	2.500	2.656
	Insert Nominal Length, 3 DIA		2.438	2.625	2.625	3.000	3.000	3.000	3.188
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA	.766	.792	.821	.906	.938	.946	1.000
		Nominal Length = 1.5 DIA	1.172	1.229	1.259	1.406	1.438	1.446	1.531
		Nominal Length = 2 DIA	1.578	1.667	1.696	1.906	1.938	1.946	2.062
		Nominal Length = 2.5 DIA	1.984	2.104	2.134	2.406	2.438	2.446	2.594
	D2	Max, Class 2B	2.391	2.542	2.571	2.906	2.938	2.946	3.125
		PD, Max, Class 3B	.7782	.8110	.8356	.9276	.9535	.9609	1.0158
		PD, Min, Classes 2B & 3B	.7766	.8089	.8339	.9254	.9516	.9590	1.0139
	D1	PD, Min, Classes 2B & 3B	.7719	.8028	.8286	.9188	.9459	.9536	1.0084
		Minor Dia, Max, Class 2B	.759	.778	.814	.890	.928	.939	.990
		Minor Dia, Max, Class 3B	.7533	.7681	.8068	.8797	.9198	.9315	.9823
	Minor Dia, Min, Classes 2B & 3B		.7450	.7550	.7980	.8650	.9100	.9227	.9720
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA	1.188	1.542	1.304	1.750	1.500	1.429	1.562
		Min When Nominal Length = 1.5 DIA	1.594	1.979	1.741	2.250	2.000	1.929	2.094
		Min When Nominal Length = 2 DIA	2.000	2.417	2.179	2.750	2.500	2.429	2.625
		Min When Nominal Length = 2.5 DIA	2.406	2.854	2.616	3.250	3.000	2.929	3.156
		Min When Nominal Length = 3 DIA	2.813	3.292	3.054	3.750	3.500	3.429	3.688
	FB	Depth of Blind Hole for Bottoming Taps							
		Min When Nominal Length = 1 DIA	1.063	1.319	1.161	1.500	1.333	1.286	1.396
		Min When Nominal Length = 1.5 DIA	1.469	1.757	1.598	2.000	1.833	1.786	1.927
		Min When Nominal Length = 2 DIA	1.875	2.194	2.036	2.500	2.333	2.286	2.458
		Min When Nominal Length = 2.5 DIA	2.281	2.632	2.473	3.000	2.833	2.786	2.990
		Min When Nominal Length = 3 DIA	2.688	3.069	2.911	3.500	3.333	3.286	3.521
	H	Min Full Thread When							
		Nominal Length = 1 DIA	.880	.990	.950	1.130	1.080	1.070	1.150
		Nominal Length = 1.5 DIA	1.280	1.420	1.380	1.630	1.580	1.570	1.680
		Nominal Length = 2 DIA	1.690	1.860	1.820	2.130	2.080	2.070	2.210
		Nominal Length = 2.5 DIA	2.090	2.300	2.260	2.630	2.580	2.570	2.740
		Nominal Length = 3 DIA	2.500	2.740	2.700	3.130	3.080	3.070	3.270
	V2	PD, Max, Class 2B	.8584	.9543	.9274	1.0890	1.0608	1.0527	1.1231
		PD, Max, Class 3B	.8568	.9522	.9257	1.0868	1.0589	1.0508	1.1212
		PD, Min, Classes 2B & 3B	.8531	.9471	.9214	1.0812	1.0542	1.0464	1.1167
	V1	Minor Dia, Max, Class 2B	.8401	.9218	.9063	1.0521	1.0361	1.0313	1.0986
		Minor Dia, Max, Class 3B	.8345	.9119	.8994	1.0421	1.0281	1.0243	1.0906
		Minor Dia, Min, Classes 2B & 3B	.8260	.8990	.8905	1.0271	1.0181	1.0155	1.0806
V	Major Dia, Max, Class 2B	.9080	1.0425	.9841	1.1882	1.1270	1.1094	1.1893	
	Major Dia, Max, Class 3B	.9064	1.0404	.9824	1.1860	1.1251	1.1075	1.1874	
	Major Dia, Min, Classes 2B & 3B	.8937	1.0193	.9678	1.1624	1.1083	1.0928	1.1708	
M	Countersink, 120° Included Angle								
	Maximum	.915	1.030	.990	1.170	1.130	1.110	1.190	
Minimum		.885	1.000	.960	1.140	1.100	1.080	1.160	
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA	.968	1.153	1.054	1.312	1.208	1.179	1.270
		Nominal Length = 1.5 DIA	1.375	1.590	1.491	1.812	1.708	1.679	1.802
		Nominal Length = 2 DIA	1.781	2.028	1.929	2.312	2.208	2.179	2.333
		Nominal Length = 2.5 DIA	2.187	2.466	2.367	2.812	2.708	2.679	2.864
		Nominal Length = 3 DIA	2.594	2.903	2.804	3.312	3.208	3.179	3.396
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA	.782	.820	.840	.937	.958	.964	1.021
		Nominal Length = 1.5 DIA	1.188	1.257	1.277	1.437	1.458	1.464	1.552
		Nominal Length = 2 DIA	1.594	1.695	1.714	1.937	1.958	1.964	2.083
		Nominal Length = 2.5 DIA	2.000	2.132	2.152	2.437	2.458	2.464	2.615
		Nominal Length = 3 DIA	2.407	2.570	2.589	2.937	2.958	2.964	3.146

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TABLE IV. (Continued)

Nominal Insert Size		1.125		1.1875	1.250		1.3125	1.375	
Threads Per Inch		7	12	12	7	12	12	6	12
Ln	Insert Nominal Length, 1 DIA	1.125	1.125	1.188	1.250	1.250	1.312	1.375	1.375
	Insert Nominal Length, 1.5 DIA	1.688	1.688	1.781	1.875	1.875	1.969	2.062	2.062
	Insert Nominal Length, 2 DIA	2.250	2.250	2.375	2.500	2.500	2.625	2.750	2.750
	Insert Nominal Length, 2.5 DIA	2.812	2.812	2.969	3.125	3.125	3.281	3.438	3.438
	Insert Nominal Length, 3 DIA	3.375	3.375	3.562	3.750	3.750	3.938	4.125	4.125
ASSEMBLED INSERT	L	Min Length of Insert When							
		Nominal Length = 1 DIA		1.018	1.062	1.125	1.143	1.188	1.250
		Nominal Length = 1.5 DIA		1.580	1.625	1.719	1.768	1.812	1.906
		Nominal Length = 2 DIA		2.143	2.188	2.312	2.393	2.438	2.562
		Nominal Length = 2.5 DIA		2.705	2.750	2.906	3.018	3.062	3.219
		Nominal Length = 3 DIA		3.268	3.312	3.500	3.643	3.688	3.875
	D2	PD, Max, Class 2B		1.0416	1.0787	1.1409	1.1668	1.2039	1.2659
		PD, Max, Class 3B		1.0393	1.0768	1.1390	1.1644	1.2019	1.2640
		PD, Min, Classes 2B & 3B		1.0322	1.0709	1.1334	1.1572	1.1959	1.2584
	D1	Minor Dia, Max, Class 2B		.998	1.053	1.115	1.123	1.178	1.240
		Minor Dia, Max, Class 3B		.9875	1.0448	1.1073	1.1125	1.1698	1.2323
		Minor Dia, Min, Classes 2B & 3B		.9700	1.0350	1.0970	1.0950	1.1600	1.2220
	FP	Depth of Blind Hole for Plug Taps,							
		Min When Nominal Length = 1 DIA		1.982	1.625	1.688	2.107	1.750	1.812
		Min When Nominal Length = 1.5 DIA		2.545	2.188	1.281	2.732	2.375	2.469
		Min When Nominal Length = 2 DIA		3.107	2.750	2.875	3.357	3.000	3.125
		Min When Nominal Length = 2.5 DIA		3.670	3.312	3.469	3.982	3.625	3.781
		Min When Nominal Length = 3 DIA		4.232	3.875	4.062	4.607	4.250	4.438
	FB	Depth of Blind Hole for Bottoming Taps,							
		Min When Nominal Length = 1 DIA		1.696	1.458	1.521	1.821	1.583	1.646
		Min When Nominal Length = 1.5 DIA		2.259	2.021	2.115	2.446	2.208	2.302
		Min When Nominal Length = 2 DIA		2.821	2.583	2.708	3.071	2.833	2.958
		Min When Nominal Length = 2.5 DIA		3.384	3.146	3.302	3.696	3.458	3.615
		Min When Nominal Length = 3 DIA		3.946	3.708	3.896	4.321	4.083	4.271
	H	Min Full Thread When							
		Nominal Length = 1 DIA		1.270	1.210	1.270	1.390	1.330	1.400
		Nominal Length = 1.5 DIA		1.830	1.770	1.870	2.020	1.960	2.050
		Nominal Length = 2 DIA		2.390	2.330	2.460	2.640	2.580	2.710
		Nominal Length = 2.5 DIA		2.960	2.900	3.050	3.270	3.210	3.360
		Nominal Length = 3 DIA		3.520	3.460	3.650	3.890	3.830	4.020
	V2	PD, Max, Class 2B		1.2262	1.1860	1.2482	1.3514	1.3112	1.3732
		PD, Max, Class 3B		1.2239	1.1841	1.2463	1.3490	1.3092	1.3713
		PD, Min, Classes 2B & 3B		1.2178	1.1792	1.2417	1.3428	1.3042	1.3667
	V1	Minor Dia, Max, Class 2B		1.1834	1.1611	1.2236	1.3084	1.2861	1.3486
		Minor Dia, Max, Class 3B		1.1730	1.1531	1.2156	1.2980	1.2781	1.3406
		Minor Dia, Min, Classes 2B & 3B		1.1559	1.1431	1.2056	1.2809	1.2681	1.3306
	V	Major Dia, Max, Class 2B		1.3396	1.2522	1.3144	1.4648	1.3774	1.4394
		Major Dia, Max, Class 3B		1.3373	1.2503	1.3125	1.4624	1.3754	1.4375
		Major Dia, Min, Classes 2B & 3B		1.3106	1.2333	1.2958	1.4356	1.3583	1.4208
	M	Countersink, 120° Included Angle							
		Maximum		1.320	1.250	1.315	1.440	1.380	1.440
		Minimum		1.290	1.220	1.285	1.410	1.350	1.410
THREAD PROJECTION	J	Min, Tang Removed, When Insert							
		Nominal Length = 1 DIA		1.482	1.333	1.396	1.607	1.458	1.520
		Nominal Length = 1.5 DIA		2.045	1.896	1.989	2.232	2.083	2.177
		Nominal Length = 2 DIA		2.607	2.458	2.583	2.857	2.708	2.833
		Nominal Length = 2.5 DIA		3.169	3.020	3.177	3.482	3.333	3.489
		Nominal Length = 3 DIA		3.732	3.583	3.770	4.107	3.958	4.146
	K	Max, Tang Not Removed, When Insert							
		Nominal Length = 1 DIA		1.054	1.083	1.146	1.179	1.208	1.271
		Nominal Length = 1.5 DIA		1.616	1.646	1.740	1.804	1.833	1.927
		Nominal Length = 2 DIA		2.179	2.208	2.333	2.429	2.458	2.583
		Nominal Length = 2.5 DIA		2.741	2.771	2.927	3.054	3.083	3.239
		Nominal Length = 3 DIA		3.304	3.333	3.521	3.679	3.708	3.896

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NATIONAL AEROSPACE STANDARD

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TABLE IV. (Continued)

Nominal Insert Size		1.500	1.625	1.875	2.250	2.500
Threads Per Inch		6	12	12	12	12
Ln	Insert Nominal Length, 1 DIA	1.500	1.500	1.625	1.875	2.500
	Insert Nominal Length, 1.5 DIA	2.250	2.250	2.438	2.812	3.750
	Insert Nominal Length, 2 DIA	3.000	3.000	3.250	3.750	4.500
	Insert Nominal Length, 2.5 DIA	3.750	3.750	4.062	4.688	5.000
	Insert Nominal Length, 3 DIA	4.500	4.500	4.875	5.625	6.250
ASSEMBLED INSERT	L	Min Length of Insert When Nominal Length = 1 DIA				
		Nominal Length = 1.5 DIA				
		Nominal Length = 2 DIA				
		Nominal Length = 2.5 DIA				
		Nominal Length = 3 DIA				
	D2	PD, Max, Class 2B	1.4022	1.4542	1.5785	1.8287
		PD, Max, Class 3B	1.3996	1.4522	1.5766	1.8267
		PD, Min, Classes 2B & 3B	1.3917	1.4459	1.5709	1.8209
	D1	Minor Dia, Max, Class 2B	1.350	1.428	1.553	1.803
		Minor Dia, Max, Class 3B	1.3396	1.4198	1.5448	1.7948
		Minor Dia, Min, Classes 2B & 3B	1.3200	1.4100	1.5350	1.7850
TAPPED HOLE	FP	Depth of Blind Hole for Plug Taps, Min When Nominal Length = 1 DIA				
		Min When Nominal Length = 1.5 DIA				
		Min When Nominal Length = 2 DIA				
		Min When Nominal Length = 2.5 DIA				
		Min When Nominal Length = 3 DIA				
	FB	Depth of Blind Hole for Bottoming Taps, Min When Nominal Length = 1 DIA				
		Min When Nominal Length = 1.5 DIA				
		Min When Nominal Length = 2 DIA				
		Min When Nominal Length = 2.5 DIA				
		Min When Nominal Length = 3 DIA				
	H	Min Full Thread When Nominal Length = 1 DIA				
		Nominal Length = 1.5 DIA				
		Nominal Length = 2 DIA				
		Nominal Length = 2.5 DIA				
		Nominal Length = 3 DIA				
	V2	PD, Max, Class 2B	1.6177	1.5615	1.6858	1.9360
		PD, Max, Class 3B	1.6151	1.5595	1.6839	1.9340
		PD, Min, Classes 2B & 3B	1.6082	1.5542	1.6792	1.9292
	V1	Minor Dia, Max, Class 2B	1.5666	1.5361	1.6611	1.9111
		Minor Dia, Max, Class 3B	1.5560	1.5281	1.6531	1.9031
		Minor Dia, Min, Classes 2B & 3B	1.5360	1.5181	1.6431	1.8931
	V	Major Dia, Max, Class 2B	1.7500	1.6277	1.7520	2.0022
		Major Dia, Max, Class 3B	1.7474	1.6257	1.7501	2.0002
		Major Dia, Min, Classes 2B & 3B	1.7165	1.6083	1.7333	1.9833
	M	Countersink, 120° Included Angle				
		Maximum	1.720	1.630	1.750	2.000
		Minimum	1.690	1.600	1.720	1.970
THREAD PROJECTION	J	Min, Tang Removed, When Insert Nominal Length = 1 DIA				
		Nominal Length = 1.5 DIA				
		Nominal Length = 2 DIA				
		Nominal Length = 2.5 DIA				
		Nominal Length = 3 DIA				
	K	Max, Tang Not Removed, When Insert Nominal Length = 1 DIA				
		Nominal Length = 1.5 DIA				
		Nominal Length = 2 DIA				
		Nominal Length = 2.5 DIA				
		Nominal Length = 3 DIA				

REVISION

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